

CLAIMS

What is claimed is:

1. A polymer electrolyte prepared by polymerizing a composition the composition comprising:

0.1 to 90% by weight of a first compound represented by formula 1, a second compound represented by formula 2 or a mixture of the first and second compounds;

0.1 to 90% by weight of a third compound represented by formula 3; and

9.8 to 99.8% by weight of a nonaqueous organic solvent containing 0.5 to 2.0 M of a lithium salt,

wherein:

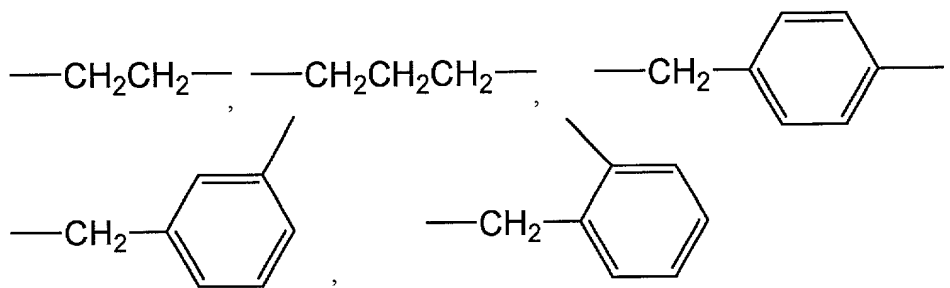
Formula 1 is $\text{CH}(\text{R1})=\text{C}(\text{R2})-\text{C}(=\text{O})\text{O}-\text{R3}-\text{N}(\text{R4})(\text{R5})$,

Formula 2 is $\text{CH}(\text{R1})=\text{C}(\text{R2})-\text{C}(=\text{O})\text{O}-\text{R3}-\text{CN}$,

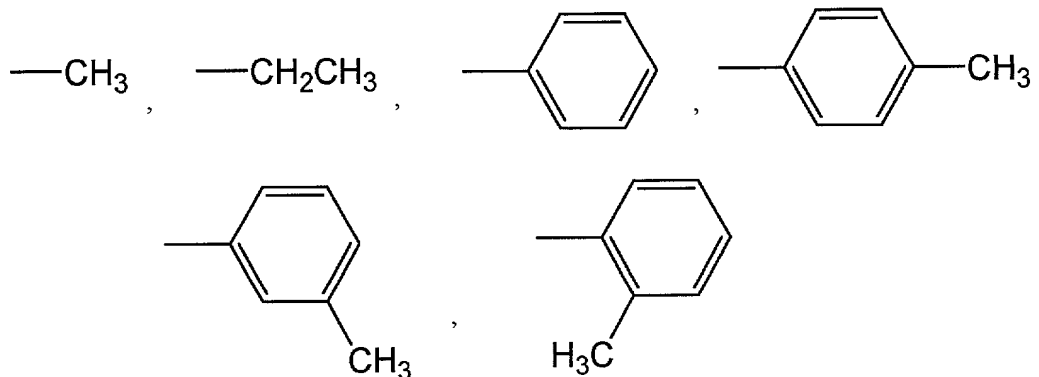
Formula 3 is $\text{Z}-\{-\text{Y}-\text{X}-\text{C}(\text{R2})=\text{CH}(\text{R1})\}_n$,

R1 and R2 can be the same or different and are selected from the group consisting of hydrogen, C1 to C10 alkyl, fluorinated C1 to C10 alkyl, C6 to C14 aryl, and fluorinated C6 to C14 aryl,

R3 is selected from the group consisting of

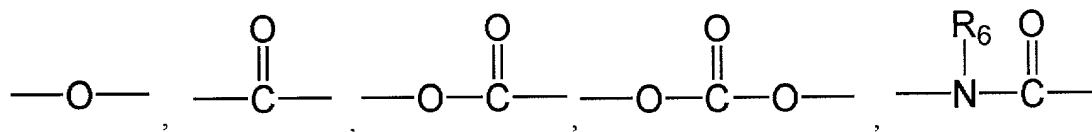


R4 and R5 are selected from the group consisting of

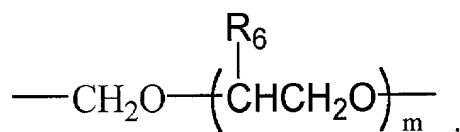
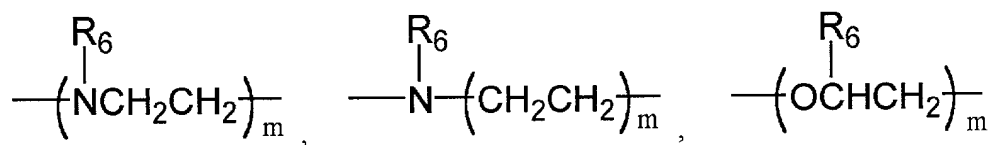
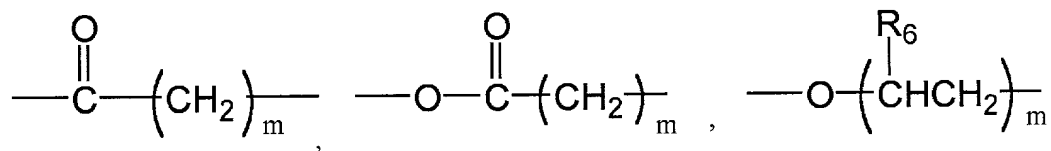


in which R4 and R5 are the same or different,

X is selected from the group consisting of



Y is selected from the group consisting of



R6 is hydrogen, methyl, ethyl, propyl or butyl group,

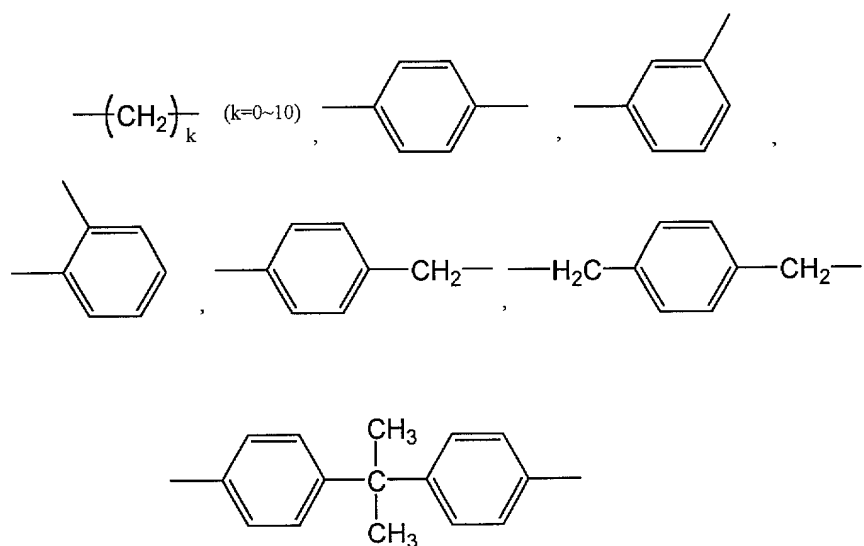
m is an integer between 0 and 10 inclusive,

n is an integer between 1 and 6 inclusive, and

Z has the following structure according to the n value:

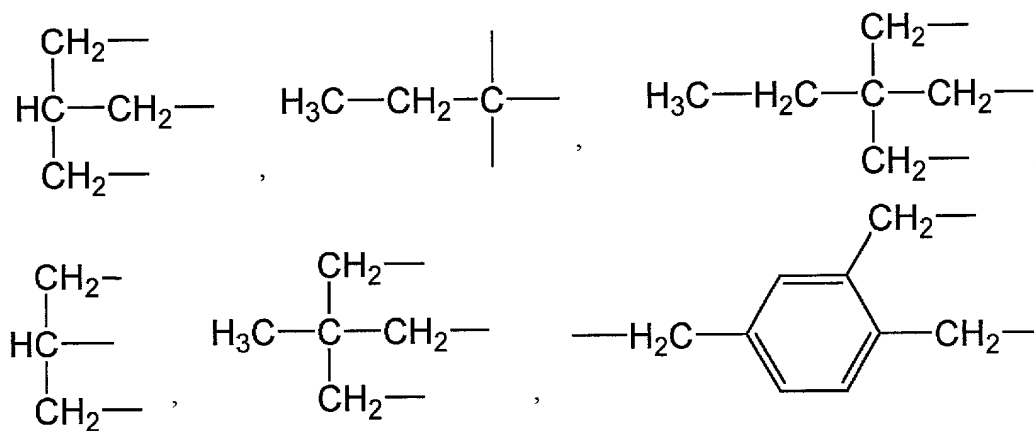
Z is H, a C1 to C12 alkyl group when $n = 1$,

Z is selected from the group consisting of



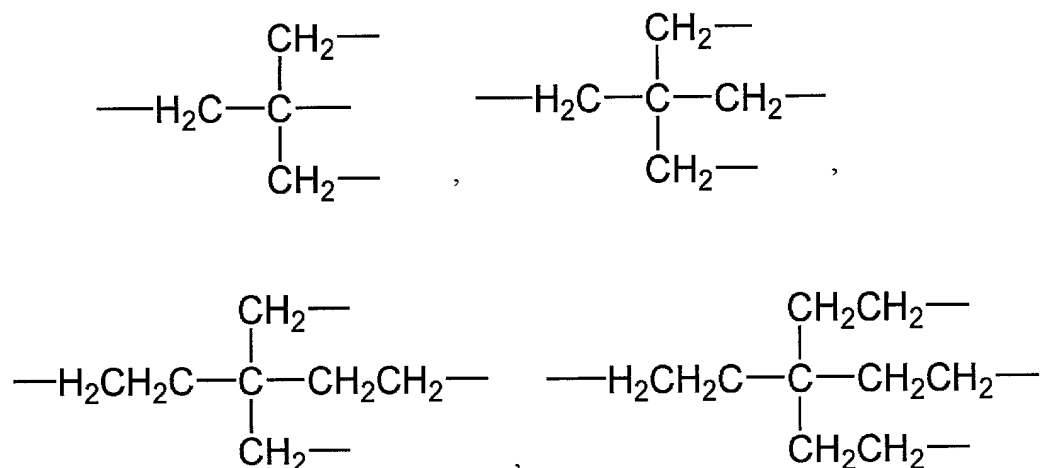
when $n=2$,

Z is selected from the group consisting of



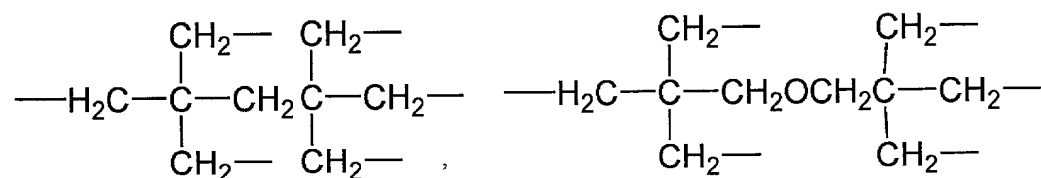
when $n=3$,

Z is selected from the group consisting of



when n=4, and

Z is selected from the group consisting of



when n= 5 or 6.

2. The polymer electrolyte according to claim 1, further comprising 0.1 to 10% by weight of at least one polymerization initiator selected from the group consisting of benzophenone compounds, diacyl peroxide compounds, azo compounds, peroxy ester compounds, and peroxy carbonate compounds, based on the total weight of the compounds represented by formulas 1, 2 and 3.

3. The polymer electrolyte according to claim 2, wherein the benzophenone

compounds are benzophenone or substituted benzophenone.

4. The polymer electrolyte according to claim 2, wherein the diacyl peroxide compounds are benzoyl peroxide, acetyl peroxide or lauroyl peroxide.

5. The polymer electrolyte according to claim 2, wherein the azo compounds are azobisisobutyronitrile (AIBN), azobis(2,4-dimethyl valeronitrile), or azobis(cyclohexanecarbonitrile).

6. The polymer electrolyte according to claim 2, wherein the peroxy ester compounds are t-butyl peroxy ester or t-amyl peroxybenzoate.

7. The polymer electrolyte according to claim 2, wherein the peroxy carbonate compounds are t-butyl peroxy isopropyl carbonate or t-butyl peroxy 2-ethylhexyl carbonate.

8. The polymer electrolyte according to claim 1, wherein the polymerization is selected from the group consisting of thermal polymerization, electron beam polymerization and UV polymerization.

9. The polymer electrolyte according to claim 8, wherein the polymerization temperature for the thermal polymerization is in the range of 20 to 100°C.

10. The polymer electrolyte according to claim 8, wherein the wavelength of light for the UV polymerization is in the range of 200 to 400 nm.

11. The polymer electrolyte according to claim 1, wherein the lithium salt is at least one selected from the group consisting of LiClO_4 , LiBF_4 , LiPF_6 , LiCF_3SO_3 , LiAsF_6 , and $\text{LiN}(\text{CF}_3\text{SO}_2)_2$.

12. The polymer electrolyte according to claim 1, wherein the organic solvent is at least one selected from the group consisting of ethylene carbonate, propylene carbonate, dimethyl carbonate, methyl ethyl carbonate, diethyl carbonate, vinylene carbonate, triglyme, tetraglyme, fluorobenzene, difluorobenzene and γ -butyrolactone.

13. A lithium secondary battery comprising:

- a cathode;
- an anode capable of accepting/releasing lithium ions with said cathode; and
- a polymer electrolyte prepared by coating the composition of claim 1 on one of said cathode and said anode and polymerizing the coated composition.

14. The lithium secondary battery according to claim 13, further comprising a separator interposed between said cathode and said anode.

15. A lithium secondary battery comprising:

a case comprising a battery assembly comprising a cathode and an anode which accepts/releases lithium ions;

a polymer electrolyte prepared by polymerizing the composition of claim 1 disposed in said case; and

a porous separator interposed between the cathode and the anode.

16. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 2.

17. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 4.

18. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 5.

19. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 6.

20. The lithium secondary battery of claim 13, wherein the composition is the

composition of claim 7.

21. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 8.

22. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 9.

23. The lithium secondary battery of claim 13, wherein the composition is the composition of claim 11.

24. The lithium secondary battery of claim 15, wherein the composition is the composition of claim 2.

25. The lithium secondary battery of claim 15, wherein the composition is the composition of claim 11.

26. A gel-type polymer electrolyte, comprising:
a monomer having polyalkylene oxide in a main chain
functional groups including one of acryl, vinyl and epoxy added to the main chain; and
a compound represented by one of Formula 1 and 2,

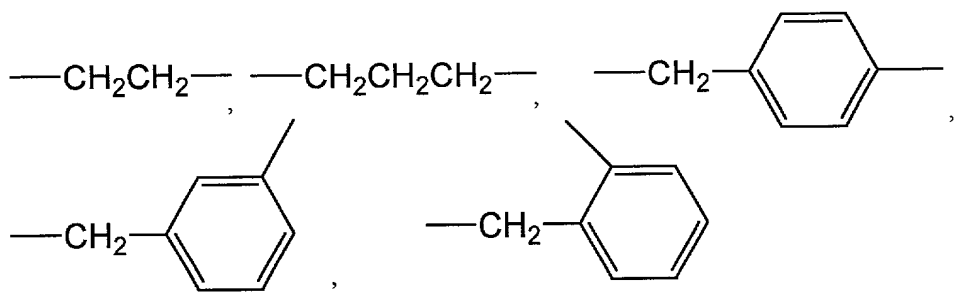
wherein:

Formula 1 is $\text{CH}(\text{R}_1)=\text{C}(\text{R}_2)-\text{C}(=\text{O})\text{O}-\text{R}_3-\text{N}(\text{R}_4)(\text{R}_5)$,

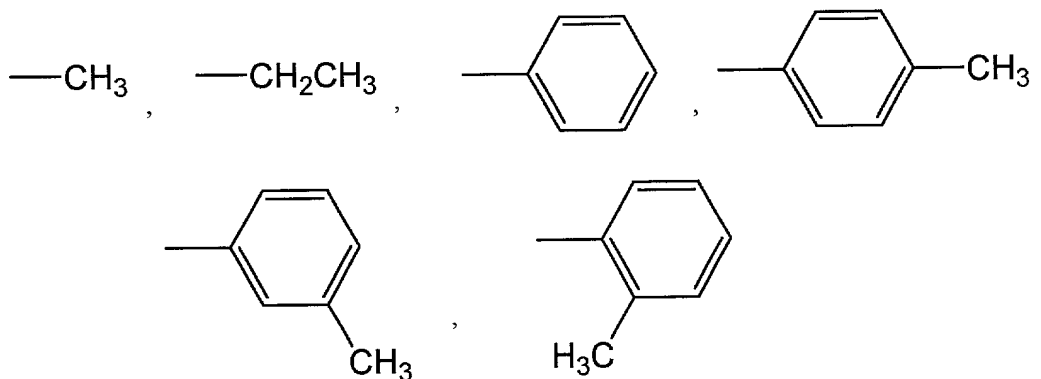
Formula 2 is $\text{CH}(\text{R}_1)=\text{C}(\text{R}_2)-\text{C}(=\text{O})\text{O}-\text{R}_3-\text{CN}$,

R_1 and R_2 can be the same or different and are selected from the group consisting of hydrogen, C1 to C10 alkyl, fluorinated C1 to C10 alkyl, C6 to C14 aryl, and fluorinated C6 to C14 aryl,

R_3 is selected from the group consisting of



R_4 and R_5 are selected from the group consisting of



in which R_4 and R_5 are the same or different,

27. The gel-type polymer electrolyte of claim 26, wherein the polyalkylene oxide comprises one of a polyethylene oxide and polypropylene oxide.

28. The gel-type polymer electrolyte of claim 26, wherein said compound comprises a mixture of compounds represented by Formulas 1 and 2.

29. A lithium secondary battery comprising:
a cathode;
an anode capable of accepting/releasing lithium ions with said cathode; and
a polymer electrolyte having a polymerized composition of claim 1 and disposed between said cathode and said anode.

30. The lithium secondary battery of claim 29, wherein said polymer electrolyte is disposed between said cathode and said anode by coating the composition between said cathode and said anode and polymerizing the coated composition.

31. The lithium secondary battery of claim 29, further comprising a separator disposed between said anode and said cathode to form an electrode assemble, wherein said polymer electrolyte is disposed between said cathode and said anode by injecting the composition into the electrode assembly and polymerizing the composition.